Safety Stand Down for Preventing Grain Entrapment

Agricultural Confined Space-Related Injuries and Fatalities – A Growing International Issue

Dr. William Field, Ed.D.
What is an Agricultural Confined Space?

“any space found in an agricultural workplace that was not designed or intended as a regular workstation, has limited or restricted means of entry or exit, and has associated with it potential physical and/or toxic hazards to workers who intentionally or unintentionally enter the space.” – NCERA 197 Committee
Examples of Confined Spaces

- Grain bin
- Silo
- Manure storage facilities
- Hopper bottom feed bin
- Grain transport vehicle
- Septic tank
- Fertilizer storage tank
- Fermentation tank
Purdue’s Work

• Started collecting data in 1977
• Initially focused on grain entrapments, expanded focus to all confined spaces by 2011
• Cases are collected from Google alerts, web searches, news clipping services, death certificates, OSHA database, NIOSH-FACE database, and interviews
• All confined space incidents collected are entered in the Purdue University’s Agricultural Confined Space Incident Database (PACSID)
• Summaries on incidents have been published annually for the last decade
• Papers on grain entrapments, incidents involving youth, grain transport vehicles, grain vacuum machines, and more have been published based on data analysis of the PACSID database
Summary of U.S. Findings

• A total of 1,873 confined space cases documented between 1962 and 2015.
• Majority of the cases are grain entrapments (about 1100 cases)
• Children and youth account for approximately 20% of documented cases
• Nearly all victims are male
• Data represents about 70% of actual cases
• About 400 cases have been added since 2011
• Not comprehensive, but best available data
• 47 cases were documented in 2015 and 25 (54%) were fatal
RESULTS:

Agricultural Confined Space Cases
Distribution of 2015 Agricultural Confined Space-related Cases by Type of Incident

- **Grain Entrapment**: 14 cases, 10 fatal, 4 non-fatal
- **Entanglement**: 5 cases, 1 fatal, 4 non-fatal
- **Fall**: 3 cases, all non-fatal
- **Asphyxiation / Poisoning**: 3 cases, 1 fatal, 2 non-fatal
- **Drowning**: 3 cases, all non-fatal
- **Pinned/Struck by object**: 1 case, 1 fatal, 0 non-fatal
Agricultural Confined-space Related Cases by Agent Category (1962-2015)

- Grain Storage Facilities: 1384 cases
- Ag Transport Vehicles: 152 cases
- Manure Storage Structures: 143 cases
- Other: 114 cases
- Forage Storage Structures: 78 cases
- Food Processing & Storage Facilities: 2 cases

Total cases: 1873
Geographic Distribution of Confined Space Cases for 2015 and Previous years (n=1873)

Total Number of Incidents

2015 Incidents

10-State Corn Belt Region: IA, IL, IN, KS, MN, MO, NE, OH, SD, WI
Number of Annual Confined Space Cases Recorded Between 2005 and 2015
RESULTS:
Grain Entrapments Cases
U.S. Grain Entrapments Between 2005 and 2015
Record number of grain entrapment in 2014

With on-farm grain storage on the rise—and a record number of grain engulfment deaths last year—agricultural leaders in Nebraska are placing special emphasis on safety during Grain Bin Safety Week, February 22-28, 2015. In an effort to#include handling safety during Grain Bin Safety Week, February 22-28, 2015. In an effort to
include elevators and other grain handlers to slow down — and take a second to consider the dangers—
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study grain. grain.
“[t]hink it is increasingly important to promote grain bin safety awareness,” said Larry Mussack, president of the Nebraska Corn Growers Association. “With just one moment of distraction, you could find yourself or someone you know in a grain entrapment situation.”

National statistics show that farming is one of the most dangerous occupations. Over the past 50 years, more than 900 cases of grain engulfment have been reported—and the number continues to rise. This is why so many of these entrapment incidents result in death.

They are some of the most horrific workplace accidents in Iowa every year. According to

Purdue University Agricultural Safety and Health Program, Iowa is the largest producer of corn and has seen over 25 grain entrapment accidents from 2005 until the time of the report. In 2014, more than 15 of those accidents were fatal.

Grain bin accident deaths typically occur when persons are working inside a grain bin and void in the grain, suctioning them underneath it. When a person steps on grain, he’s at risk for falling into a hollow space and being suctioned under. The person may become buried under the grain within seconds and can suffocate before help arrives. Rescue of a person buried in grain is extremely difficult, which is why so many of these entrapment incidents result in death.
Age Distribution for All Grain Entrapment (1964-2014)

n=868
During 2015 the primary medium was corn (52%) and soybeans (17%).

792 of the 1096 grain entrapment cases the medium was known.

The vast majority was corn with 486 cases

Soybean was the second most with 120 cases

Wheat was third with 36 cases

Remaining medium (150 cases) included Silage, Milo, Rice, Sunflowers, Cotton Seed, Barley, Sorghum, Peanuts, Hay, Cotton, Beans, etc.
Factors Influencing the Trend in Grain-Related Entrapments

- Increasing production of grain
- Longer term storage of grain increasing potential for spoilage
- More storage being built at exempt facilities
- Increased rate of grain handling
- Increased size of storage structures
- Expanded use of grain for energy production
- Changing workforce
- Reluctance to invest in drying grain (time/money)
- Genetic modifications that increase drying time
International Incidents

• No known international effort to document incidents involving agricultural confined spaces
• International cases documented most frequently involved:
  – Grain storage and handling
  – Manure storage
• Grain-related cases have been identified around the world
• Most documented cases involve multiple workers
• The frequency of cases being documented is increasing
• Cases involving biogas generation have been documented.
Global Ag confined Space-Related Fatalities

- 1990-2008: 58+3 fatalities in 2015
- 2004-2015: 16 fatalities
- 1991-2010: 6 fatalities
- 2006-2015: 7 fatalities
- 2011-2015: 1 fatality

Countries with fatalities:
- Canada (CA): 58+3
- United States (US): 16
- UK: 3
- Ireland: 6
- China: 6
- South Africa: 2
- Saudi Arabia: 1
- Spain: 1
- Australia (AU): 7
- New Zealand (NZ): 1
Conclusions

- Slightly more than half of all agricultural confined space-related incidents are grain entrapments
  - Falls and Entanglements represent next largest incident categories in confined spaces

- Seven documented incidents involving youth under the age of 21 occurred in 2015 in sharp contrast with 0 incidents in 2013
  - Overall 20% of all incidents involve youth under age of 21

- Additional 71 cases from prior years yet to be catalogued
- Increased number of cases being documented internationally
- Still large amount of unknowns
Check Out Our Website

www.agconfinedspaces.org
Questions?

E-mail: field@purdue.edu